

# TEST & MEASUREMENT

N E W S

HEWLETT-PACKARD

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HP 8562 Portable  
Spectrum Analyzer



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PACKARD



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HP's new microwave vector network analyzer, the HP 8510B, keeps up with your high-frequency test needs from 45 MHz to 100 GHz while providing next-generation performance and capability. Page 6.

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## GENERAL-PURPOSE INSTRUMENTS

## High-performance test system for mixed-signal ICs

A new IC test system targeted at mixed-signal (digital/analog) semiconductor IC test applications, the HP 9480 Analog LSI Test System, introduces a modular system architecture offering measurement performance and at-speed testing previously available only from bench instrumentation.

The system offers modular configurability for both engineering and production test applications of VHF mixed-signal devices, such as flash converters and high-speed video DACs.

### High-fidelity, low-noise hardware

The system hardware design provides an impedance-matched (coaxial) signal environment over the entire signal path, giving maximum possible signal transmission fidelity at frequencies beyond 100 MHz. An impedance-matching design assures high measurement accuracies. Stimulus and response modules are optically isolated from the system CPU.

In addition, the system grounding scheme provides a good measurement noise floor by treating measurement modules, clock and synchronizing lines, and the DUT interface as a complete system.

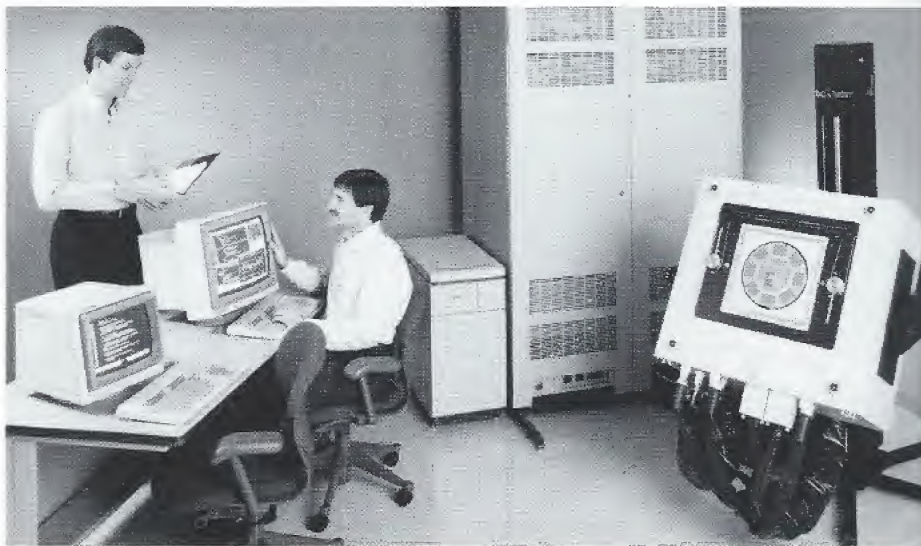
### Advanced software

The complexity of mixed-signal ICs creates a serious need to reduce the cost of test program development. Advanced HP 9840 software applications help keep pace with complex testing problems and let you control test development and implementation costs more closely.

Multiuser, multitasking operating software is provided by AT&T's UNIX® System V Interface Definition Issue 1 with real-time extensions. User-interface software provides multiple pop-down windows and menu fill-in features, and incorporates comprehensive data-analysis programs.

The test applications software includes a Pascal-like programming language enhanced by an extensive set of program development tools. These include a symbolic debugger (data reference within the test program), virtual instruments (including oscilloscope), and panels that provide for monitoring and setting measurements and source modules without the presence of actual hardware.

A 32-pin HP 9480 Analog LSI Test System costs approximately \$650,000. For more information, check **A** on the HP Reply Card.



The new HP 9480 Analog LSI Test System offers modular configurability for both engineering and production test applications.

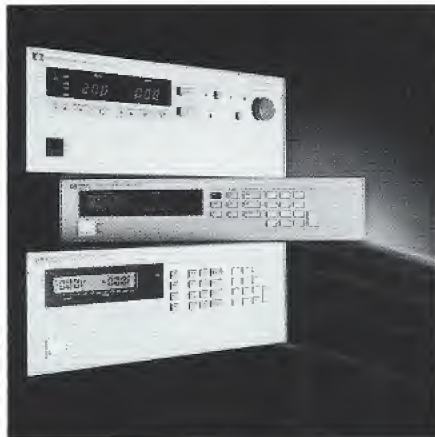


## GENERAL-PURPOSE INSTRUMENTS

## Order new HP-IB power supplies by July 31 and save over \$500

Three new programmable power supplies, the HP 6632A, HP 6633A, and HP 6634A, offer significant systems-design advantages over currently available alternatives. Each integrates the functions of power supply, HP-IB (IEEE 488/IEC 625) isolated D-to-A current and voltage programmers, DVM, and precision current-monitor shunt into one single-output, high-performance package. This one-box approach yields substantial savings in system-integration time, rack space, and documentation cost.

Each model supplies a total of 100 watts in a 3.5-inch-high (88-mm) full-rack-width package. A linear (series) regulator is used to achieve low output noise (3 mV p-p) and response time. Rise or fall time, both no-load and full-load, is 15 ms.



These 100W, HP-IB programmable power supplies include an integral DVM and current-monitor shunt to simplify systems integration.

Rapid no-load down-programming is assured through the use of a full-load-rated pull-down circuit. These are two-quadrant, fully operational power supplies that can sink as well as source full rated current on a sustained basis.

A fast/normal mode switch permits operation with either maximum programming speed or lowest output noise. In fast mode the response time is 400 microseconds and noise is 10 to 25 mV p-p.

Output ratings are: 0 to 20V at 0 to 5A for the HP 6632A, 0 to 50V at 0 to 2A for the HP 6633A, and 0 to 100V at 0 to 1A for the HP 6634A.

A special introductory offer price of \$995 is limited to one unit from the above models per customer location (expires July 31, 1987). Additional units are priced at \$1,500 each. Call 1-800-558-3077 for details.

For more information, check **B** on the HP Reply Card.

## Tester delivers high throughput and high resolution for dc semiconductor testing



Eight plug-in slots let you tailor the HP 4142B Modular DC Source/Monitor to your high-resolution, high-throughput IC test needs.

Want higher dc semiconductor measurement sensitivity without sacrificing resolution and speed? Here's the new HP 4142B Modular DC Source/Monitor, a powerful dc measurement instrument especially designed for use in high-throughput semiconductor test systems.

The HP 4142B is well-suited for new device development, production process monitoring and evaluation, and off-line quality testing.

Your HP 4142B's configuration is up to you. Its fully user-specifiable plug-in module architecture provides eight plug-in module slots. You can specify almost any combination of the four presently available modules to custom-configure the HP 4142B. You can include up to 32 source/monitor units in your system.

The HP 4142B features highly sensitive measurement capabilities down to 4  $\mu$ V or 20 fA, and a wide measurement range up to 400V and 1.6A with a full five digits of measurement resolution. By incorporating newly developed enhancements in analog feedback technology, the HP 4142B can obtain such necessary semiconductor parameters as threshold voltage and forward current gain in as little as 12 ms with accuracies of 0.02%.

The HP 4142B Modular DC Source/Monitor is priced at \$21,700 to \$36,800 depending on the module configuration. For more information, check **C** on the HP Reply Card.

## X-Y recorders discontinued



The HP 7090A is not only a recorder that captures low frequency signals up to 3 kHz, but also a high-quality plotter.

The HP 7015B, 7035B, 7045B, and 7046B X-Y recorders have been discontinued. HP will continue to support these recorders and all related supplies until May 1, 1992. While there is no recommended replacement for the HP 7015B and 7035B, the HP 7090A Measurement Plotting System is recommended to replace the HP 7045B and 7046B recorders. The HP 7090A is priced at \$4,900.

For more information, call your local HP Sales Office.



## GENERAL-PURPOSE INSTRUMENTS

## New plug-in switch modules increase flexibility

Nine new plug-in switch modules increase the switching flexibility of HP's high-performance HP-IB switch/test unit, the HP 3235A. These switch modules include 75- $\Omega$ , 1.3-GHz multiplexers,  $4 \times 8$  matrix modules, and multiplexers with thermocouple compensation.

The HP 34508A/B/C 75- $\Omega$  RF multiplexer module is well-suited for broadband switching of high-frequency or fast digital signal typically found in telecommunications and video applications.

Three independent 75- $\Omega$  multiplexers provide bidirectional switching of signals from dc to 1.3 GHz. High channel isolation (greater than 80 dB at 100 MHz) assures good signal integrity for wide dynamic-range measurements with spectrum, network, or distortion analyzers.

Each module contains two banks of  $1 \times 4$  multiplexers and one  $1 \times 3$  multiplexer. Off channels can be terminated in 75 $\Omega$  to maintain proper operation of crit-

ical DUT circuitry or test equipment.

Terminal blocks are available for easier connections to your DUT and are available in either cable-terminated BNCs or bulkhead BNCs. If you want to connect directly to the multiplexer, the terminal block can be deleted.

### Thermocouple measurement capability

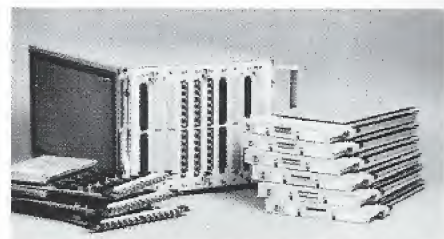
The HP 34501T/2T/7T thermocouple-compensated modules provide accurate temperature measurements in environmental chambers, production burn-in applications, and product-reliability testing.

These flexible modules can make thermocouple measurements on up to 30 channels when used with the HP 34520A/B DVM plug-in module.

Three types of relays are available: armature, dry reed, and mercury-wetted reed.

### Matrix flexibility

The HP 34501M, HP 34502M, and HP 34507M  $4 \times 8$  matrix modules are well-suited for applications where flexible signal switching is your highest priority. Signals between dc and 1 MHz and up to 2A at 250V can be switched. This matrix configuration provides the greatest variety of connection paths between test sig-



Nine new plug-in switch modules increase the switching flexibility of the high-performance HP-IB switch/test unit, the HP 3235A.

nals, and often leads to simpler external fixturing than a multiplexer.

Armature, dry-reed, or mercury-wetted relays are available. Larger matrices are also possible by combining modules.

Up to 10 plug-in switching modules can be configured in each HP 3235A to switch signals ranging from microvolt multimeter inputs to 250V, 3A power-supply outputs.

The HP 3235A is \$4,400. The plug-in modules range from \$1,200 to \$1,750.

For more information, check **D** on the HP Reply Card.

## Instrument Notes

**Temperature transducers from HP Direct.** You can now order selected thermocouple, thermistor, and RTD temperature transducers for HP's data-acquisition instruments from HP Direct. Customers in the U.S. can get 24-hour fast-ship service by calling 800-523-2121 between 6:00 a.m. and 5:00 p.m. PST. If you are outside the U.S., you can order by purchase order through any HP sales office.

**MATE-compatible microwave counter.** If you need a MATE-compatible microwave or millimeter-wave pulse counter, take a look at the new HP 5345M. Used with the HP 5356A/B/C/D, the HP 5345M makes high-resolution frequency measurements to 110 GHz. It has resolution as fine as 100 Hz for pulsed and 1 Hz for CW signals. The HP 5345M can accept external gates as short as 20ns and also contains a full-performance 500 MHz universal counter. It is priced at \$20,700. Contact your local sales office.

**PC Instruments handbook.** You can get documented application examples of PC Instruments (PCI) in this new applications handbook from HP. It includes information on topics such as the PCI oscilloscope and benchmarking the PCI Programming Library. The applications can be used standalone or as test system building blocks. Check **E**

**Industrial data acquisition.** A new brochure "The HP 3852A in Industrial Applications" describes this DA/C unit as installed in a NEMA cabinet, with accessories, suitable for a harsh environment. The brochure describes interfacing with sensors and thermocouples, etc., hardware for hardening and enhancing the system, and available software and computers. Check **F**

**Impedance analyzer application notes.** The HP 4194A Impedance/Gain-Phase Analyzer has prompted a number of customer application reports from our field engineers. These are now available as brief application notes (below).

Title	Check on reply card
Impedance Characterization of Resonators Using the HP 4914A (AN 339-1)	<b>G</b>
Characteristic Impedance Measurement of PC Board Circuit Patterns (AN 339-2), and Crosstalk and Impedance Measurements of PC Board Patterns (AN 339-3)	<b>H</b>
Measuring the Characteristic Impedance of Balanced Cable using the HP 4194A (AN 339-4)	<b>I</b>
Multi-frequency C-V Measurements and Doping Profile Analysis of Semiconductors (AN 339-5)	<b>J</b>
Static Head Testing for Disc Drives (AN 339-6)	<b>K</b>
Constant Current Measurements Using the HP 4194A (AN 339-8)	<b>L</b>
Negative Impedance Measurements of Crystal Oscillators (AN 339-9)	<b>M</b>
Filter Test for Production and Incoming Inspection (AN 339-11)	<b>N</b>



## RF &amp; MICROWAVE



The new HP 8562A/B Portable Spectrum Analyzers (1 kHz-22 GHz) feature synthesized tuning, built-in AM/FM demodulators

and speaker, and a plug-in test-and-adjustment module.

## Portable spectrum analyzers go anywhere

The new HP 8562A and 8562B microwave spectrum analyzers put high-performance, synthesized tuning, and powerful digital processing into a lightweight (44-lb/20-kg), portable package. Ruggedized to meet MIL-T-28800C requirements for vibration, pulse shock, and transit drop, these analyzers can survive harsh field conditions. They make accurate measurements at any location, whether it's a lab bench or a snowy mountain top.

Both the HP 8562A and 8562B cover the 1-kHz-to-22-GHz range with internal mixing, and the 18-GHz-to-325-GHz range with external mixers from HP and other manufacturers. The HP 8562A has tracking preselection from 2.75 GHz to 22 GHz, while the HP 8562B is a lower-priced, nonpreselected version for applications that are primarily below 2.9 GHz. Except for preselection, the two analyzers are identical.

### Test and adjustment module

An optional Test & Adjustment Module, the HP 85629A, plugs onto the rear panel of the HP 8562A/B to simplify and speed servicing. The module's 8-input voltmeter and built-in testing capability

help isolate failures to the board level without external test equipment. Once repairs are complete, the HP 85629A controls both internal analyzer settings and external test equipment to provide fast, accurate adjustments.

### Self-aligning IF

The HP 8562A/B has a continuously self-adjusting IF section that maintains the adjustment of reference level steps, log amplifiers, and resolution bandwidths, even in extreme environmental conditions. This feature permits a short, five-minute warm-up time in ambient temperatures from  $-10^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$ .

### AM/FM demodulation

A built-in speaker and AM/FM demodulation let you monitor a signal of interest while you are viewing a wide-frequency spectrum. All you have to do is place a marker on the signal and activate the DEMOD function.

### Measurement and data processing

More than 100 digital functions are built into the HP 8562A/B. Commonly-used functions have dedicated hardkeys, while over 100 additional functions are accessed by CRT-menu softkeys. Softkey functions include SIGNAL TRACK

(keeps the analyzer tuned to a marked signal even while it drifts) and FREQUENCY COUNT (provides accurate frequency measurement of a marked signal even in wide-span displays).

These analyzers can also store up to ten instrument states and eight traces in non-volatile memory.

### Excellent performance

The analyzers have synthesized tuning with 100-Hz tuning steps and a time base with 4 ppm/year drift rate. Resolution bandwidths are selectable from 100 Hz to 1 MHz in a 1, 3, 10 sequence. Flatness is  $\pm 4.3$  dB at 22 GHz.

The HP 8562A is priced at \$35,000 and the non-preselected HP 8562B is \$31,000. The HP 85629A Test & Adjustment Module is \$2,000.

For more information, check **O** on the HP Reply Card.



**RF & MICROWAVE**

## New microwave network analyzer increases performance

HP's newest microwave vector network analyzer, the HP 8510B, keeps pace with your high-frequency test needs from 45 MHz to 100 GHz. Its predecessor, the HP 8510A, set the standard in RF and microwave component test applications. Now, the HP 8510B family of products provides next-generation performance and capability.

Real-time error-corrected measurements are 25% faster. Transforming a frequency-domain measurement to the time domain is up to 16 times faster. Controlled by an external computer, the HP 8510B processes commands and transfers data over the HP-IB (IEEE 488/IEC 625) twice as fast as its predecessor.

Overall measurement accuracy is improved because the calibration standards are up to 6 dB better. Now, accuracy enhancement techniques can produce 56-dB effective directivity and source match. A new "slotless" female center contact is used on 3.5-mm and Type N calibration devices to provide, for the first time, measurement traceability to the U.S. National Bureau of Standards.

### Two-source control

Built-in control of two microwave sources allows the HP 8510B to make measurements at millimeter-wave frequencies without the aid of an external computer. Measurements in waveguide bands from 26.5 GHz to 100 GHz are twice as fast as they were before.

Built-in, two-source control also provides the HP 8510B with the ability to measure frequency translation components and systems. Amplitude and phase tracking measurements of mixers or the channels of a direction finding receiver are easy because the HP 8510B can independently set the frequency of the sources providing the RF and LO inputs as well as the frequency at which the HP 8510B makes the measurement (such as the IF output from a mixer).

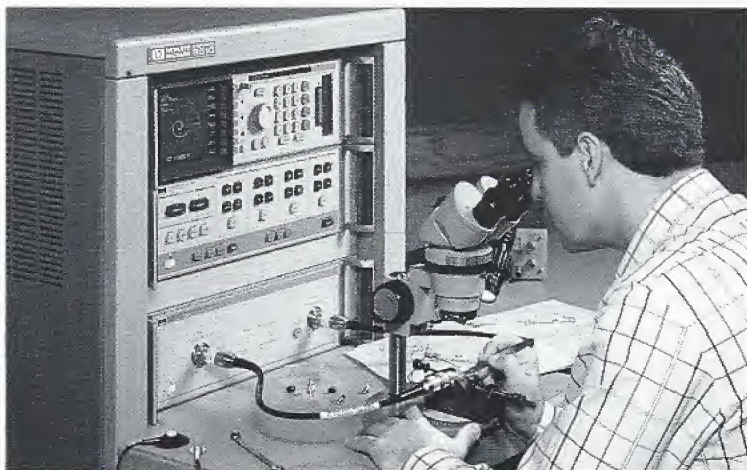
### Semiconductor and antenna measurements

For characterizing discrete transistors and ICs mounted in fixtures, the HP 8510B offers a new through-reflect-line (TRL) calibration method. By inserting device-like standards at the device interface, the fixture's effects can be measured and removed through the built-in, error-correction capability of the HP 8510B.

For antenna pattern measurements, the measurement ports of the system can be placed behind the antenna under test. Faster single-frequency measurements and an external trigger input let you synchronize the HP 8510B with the motion of an antenna positioner.

Complete system prices range from approximately \$80,000 to \$162,000.

For more information, check **P** on the HP Reply Card.



The new HP 8510B solves measurement problems more quickly and easily than its predecessor.

## Upgrade your HP 8510A

The HP 85103A Performance Upgrade Package adds the power of HP's latest microwave network analyzer, the HP 8510B, to an HP 8510A.

New computer hardware increases internal data-processing rates. More memory removes the current limitations on internal data storage. New firmware adds capabilities for new applications, such as testing frequency translation devices. New calibration algorithms help solve tough measurement problems, such as characterizing devices mounted in fixtures.

The maximum number of trace points is increased to 801. The arbitrary frequency sweep mode allows you to define the exact frequencies or sweep segments at which the DUT is measured. Built-in control of a compatible external disc drive provides the capability to store measurement data, instrument states, and calibration sets on external, permanent media.

The price of the HP 85103A is \$15,000. For more information, check **Q** on the HP Reply Card.

## New application note on high-speed fiber optic components

Application Note 351, Characterization of High-Speed Optical Components with an RF Network Analyzer, describes how optical converters and network analyzers can be used for a variety of photonic measurements. The note describes making measurements on both electrical and optical components using the HP 8753A RF network analyzer and commercially available converters. Advantages of swept-modulation frequency-domain measurements are compared with time-domain analysis tools such as pulse generators and oscilloscopes.

For a free copy of Application Note 351, check **S** on the HP Reply Card.



## RF &amp; MICROWAVE

## Measurement automation software for the HP 8753A

Measurement automation can enhance throughput, consistency, and quality of measured data. With an HP 8753A RF network analyzer system and an HP 9000 Series 300, the HP 85160A Measurement Automation Software not only enhances but simplifies transmission and reflection measurements of RF devices.

### Guided measurements

The HP 85160A shortens the path to productivity by guiding you through the basics of configuring and performing a measurement. By simply answering a series of questions about the test parameters, following a step-by-step calibration



New measurement automation software from Hewlett-Packard improves transmission and reflection measurements of RF test devices.

sequence, and connecting the device, a high-accuracy, consistent measurement can be made. Once measured, the data

can be easily printed, plotted, or stored in a variety of user-definable formats.

To be certain every device meets production specifications, you can enter limits and have the measurement system automatically test for conformance.

This software runs only on the HP 9000 Series 300.

The HP 85160A Measurement Automation Software is \$1,500.

For more information, check **R** on the HP Reply Card.

## Microwave Notes

We welcome our *Wavelength* readers. We know you want to keep up with what's going on at HP, not just with the blockbuster new products, but also small things of use to practicing engineers. So we'll have a column in each issue focused on small RF and microwave news items.

**Components.** 2.4-mm coaxial connectors have been in the industry news recently for work from dc to 50 GHz. Co-inventor company M/A-COM Omni Spectra now offers two evaluation kits: P/N 8598-4002-00 for the hermetic version and P/N 8598-4001-00 for the cable version. (Those are M/A-COM part numbers, so you should contact their sales offices directly.)

**Signal generators.** Early users of the HP 8770A Arbitrary Waveform Synthesizer (dc to 50 MHz) have been asking to synchronize waveforms from two or more units. Now, up to three new units can be locked together. And retrofit kits are available for installed units.

**Noise figure.** Do you need a noise figure meter for the 10-to-1800-MHz range? HP 8970B Option H18 does the job with only slight degradation over standard units which stop at 1600 MHz.

**Training.** Prof. Tim Healy, of the MW and Communications Lab at Santa Clara University, California, has published a lab manual entitled, "Experiments in RF and

Microwave Network Analysis," which is available for \$20 (US) from the University. It is written around modern analyzers like the HP 8753A, 8510A, and 3577A. Call 408-554-4482 or write to Santa Clara University, Microwave Laboratory, Santa Clara, California 95053.

**Network analyzers.** HP 11613B Calibrator allows on-site verification and maintenance of the calibration constants stored in the HP 8757A and 8756A Scalar Network Analyzer memories. Those constants compensate for detection diode imperfections as a function of power level. Requires an HP 9000 Series 200/300 Computer, and the software is included.

Connector sex on scalar directional bridges is an important topic. Connector-savers and cross-sex adapters degrade even the most precise measurements, but still may be preferred to wearing out expensive high-directivity bridges. Other times you need all the directivity you can get. That's why the new HP 85027E Directional Bridge has a male APC-3.5 test port for testing female-connector devices. It complements the HP 85027B bridge (female test port).

**Software corner.** For those of you in the EMI business, HP has two new software packages that run on HP spectrum analyzers/EMI receivers: HP 85864C EMI Measurement Software for conducted and radiated emission tests, and the HP 85870A Open-site EMI Measurement System Software for commercial

radiated-emission compliance tests. Check **T**

### New literature

Title	Check on reply card
Measurement Applications for Digital Microwave Radio (AN 343-1)	<b>U</b>
Coherent Pulsed Tests of Radar and DE Systems (AN 343-3)	<b>V</b>
Introductory Operating Guide to the HP 8780A Vector Signal Generator	<b>W</b>
Coaxial and Waveguide Measurement Accessories Catalog (MTE Catalog)	<b>X</b>
Signal Generator Selection Guide	<b>Y</b>
Spectral Purity Characteristics of HP Microwave Signal Sources (AN 329)	<b>Z</b>
Four Steps to Buying an RF/Microwave Power Meter (AN 64-4)	<b>1</b>



## COMPUTERS/CONTROLLERS

## HP BASIC instrument-control language for the Vectra PC

HP's premier instrument-control language is now available for the HP Vectra Personal Computer. The HP BASIC Language Processor consists of a Vectra plug-in card with HP-IB interface, HP BASIC 5.0, and support software.

Now personal computer users do not need to forego the timesaving advantages of HP BASIC or rewrite their HP 9000 Series 200/300 HP BASIC programs.

Other benefits include: low entry price, access to industry-standard LAN, common DOS/BASIC file structure, and compute and I/O performance greater than an HP 9816.

The language processor board, which includes a Motorola 68000 CPU and up to 4M bytes of RAM (512K bytes standard), emulates an HP 9000 Series 200 workstation. It includes built-in HP-IB and the standard Series 200/300 DIO interface. BASIC is run like other PC-DOS applications and is compatible with DOS files and peripherals.

Since HP BASIC runs on its own processor board and not on the Vectra PC's Intel 80286, simultaneous operation of BASIC programs and PC-DOS applications is possible.

With optional hardware, the processor operates on HP networks such as SRM and OfficeShare, and can pass files to ARPA (IEEE 802.3) networks as well.

### Bundled systems

Also available are preassembled HP Vectra PC systems (Model PC-308M/C) featuring the new HP BASIC Language Processor. These bundled systems allow purchase of a complete monochrome or color system with just one HP part number. The HP BASIC Language Processor board, hard disc, video card and interface card are installed at the factory.

The HP BASIC Language Processor (HP 82300A) with 512K bytes of RAM is \$1,295. A 512K-byte RAM expansion kit (HP 82303A) is \$495. A RAM expansion board (HP 82305A), which includes 512K bytes and is expandable in 512K-byte increments with HP 82303As, is \$595. The Model PC-308M is \$6,495. The Model PC-308C is \$7,295.

For more information, call your local HP Sales Office.

## Hybrid circuit design with HP EGS

The new Hybrid Circuit Design Module (HP 74307A) is now available for the HP Engineering Graphics System (HP EGS). HP EGS is a modular, entry-level computer-aided design system with more than 4,000 installations worldwide.

The Hybrid Circuit Design Module (HCD) includes interactive and automatic features: automatic thick-film resistor generation, links from the schematic drawing module of HP EGS (HP 74305A Opt. 100) and the Electronic Design System (HP 74350C) starter library containing more than 300 hybrid parts, and support of irregularly shaped conductors.

Flexible editing features move, rotate, stretch, and mirror one or several parts or conductors on a grid with resolution to 0.01  $\mu$ m. Conductor width can vary along individual conductors, and from conductor to conductor.

The HP EGS family of products is supported on HP 9000 Series 200 and 300 systems, and the Shared Resource Manager (SRM) enables designers to share peripherals as well as data.

The basic HP EGS system (HP 74305A) is \$6,000. The Schematic Drawing Module, which is recommended, costs \$1,000 with the basic system (HP 74305A Option 100), or \$2,000 as an add-on (HP 74306A Option 100).

For more information, check **2** on the HP Reply Card.

## MORE PRODUCTS

## New wideband cascadable amplifiers with variable gain



New HP amplifiers are designed for wideband digital applications and analog applications.

The HAMP-4001 and -4002 variable-gain controllable amplifiers are the first of a new family of wideband amplifiers for use in circuits requiring automatic gain control (AGC).

HP's new thin-film hybrid variable-gain amplifiers employ the proven HP PIN diode and microwave-transistor technologies in a circuit conveniently packaged in an industry standard TO-8.

These amplifiers provide the designer with a modular solution to system-gain-control requirements easily cascaded with other standard amplifiers in a 50- $\Omega$  system. The variable-gain amplifiers require only power connections, with the biasing and coupling provided internally.

The HAMP-4001 provides 22-dB gain with a 30-dB gain control range available over the frequency range of 2 to 1,250 MHz. The HAMP-4002 provides 17-dB gain with a 29-dB gain control range over the frequency range of 2 to 1,600 MHz.

These flat stable characteristics are maintained for both parts over both the gain-control range and the temperature range of  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

In quantities of 100, the HAMP-4001 is \$100 each; the HAMP-4002 is \$115 each. For more information, check **3** on the HP Reply Card.